

PCT

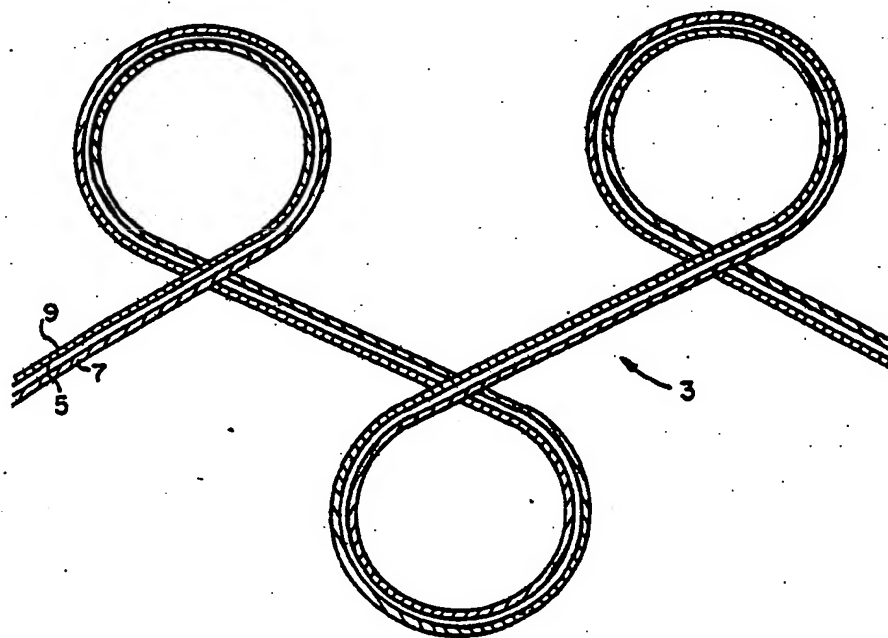
WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification 4 :</b> D04B 7/16, 11/12, 21/12 D04B 21/14, 21/16, 21/18 D04B 23/06	<b>A1</b>	<b>(11) International Publication Number:</b> WO 85/ 03091 <b>(43) International Publication Date:</b> 18 July 1985 (18.07.85)
<b>(21) International Application Number:</b> PCT/US85/00033 <b>(22) International Filing Date:</b> 9 January 1985 (09.01.85) <b>(31) Priority Application Number:</b> 569,582 <b>(32) Priority Date:</b> 10 January 1984 (10.01.84) <b>(33) Priority Country:</b> US  <b>(71)(72) Applicant and Inventor:</b> MORE, Marcos, A. [US/ US]; 7516 Dean Hill Drive, Knoxville, TN 37919 (US).  <b>(74) Agent:</b> HARDAWAY III, John, B.; Bailey & Harda- way, 125 Broadus Avenue, Greenville, SC 29601 (US).  <b>(81) Designated States:</b> CH, DE, FR (European patent), GB.		<b>Published</b> <i>With international search report.</i>

**(54) Title:** MEDICAL AND ORTHOPEDIC SUPPORT FABRIC



BEST AVAILABLE COPY

**(57) Abstract**

A fabric (1) for medical and orthopedic applications which may be cut by severance to desired shapes without signi-

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT Austria  
AU Australia  
BB Barbados  
BE Belgium  
BG Bulgaria  
BR Brazil  
CF Central African Republic  
CG Congo  
CH Switzerland  
CM Cameroon  
DE Germany, Federal Republic of  
DK Denmark  
FI Finland  
FR France

GA Gabon  
GB United Kingdom  
HU Hungary  
IT Italy  
JP Japan  
KP Democratic People's Republic  
of Korea  
KR Republic of Korea  
LI Liechtenstein  
LK Sri Lanka  
LU Luxembourg  
MC Monaco  
MG Madagascar  
ML Mali

MR Mauritania  
MW Malawi  
NL Netherlands  
NO Norway  
RO Romania  
SD Sudan  
SE Sweden  
SN Senegal  
SU Soviet Union  
TD Chad  
TG Togo  
US United States of America

-1-

## MEDICAL AND ORTHOPEDIC SUPPORT FABRIC

## Background of the Invention

5 This invention relates generally to the art of knit fabrics and more particularly to a knit fabric with medical applications.

10 Various fabrics have been utilized for orthopedic applications. A bandage fabric described in United States Patent No. 3,570,482 to Emoto. Such a bandage is comprised of chain stitches formed of non-elastic yarn running in one direction and elastic polyurethane running in another. Another popular surgical bandage and orthopedic support is sold under the trademark "Ace Bandage." Such a fabric is generally elastic in the length direction so as to provide a bandage which may be applied under tension so as to

-2-

provide a constant force to the area of the body to which it is wrapped.

Prior art knit fabrics are disclosed in United States Patent Nos. 3,069,885 and 2,127,139 which are herewith incorporated by reference.

While other prior art bandages exist, all are subject to problems associated with raveling in the event that the fabric itself is severed.

#### SUMMARY OF THE INVENTION

It is thus an object of this invention to provide a fabric for surgical and orthopedic applications which may be cut by severance to desired shapes without significant raveling.

It is a further object of this invention to provide such a fabric which is elastically deformable in both the length and width directions.

It is a further and more particular object of this invention to provide such a fabric which is subject to many and diverse orthopedic and surgical applications.

These as well as other objects are accomplished by a fabric for medical and orthopedic support comprising a

-3-

double-plaited ribbed knit fabric plaited with a spandex yarn to provide a fabric which stretches in both the length and width directions.

#### BRIEF DESCRIPTION OF THE DRAWINGS

5        Figure 1 of the drawings illustrates a knit fabric in accordance with this invention.

Figure 2 of the drawings illustrates the double plaited knit in accordance with this invention.

10       Figure 3 of the drawings illustrates a yarn feeder for producing the fabric of this invention.

#### DETAILED DESCRIPTION

15       In accordance with this invention it has been found that a ribbed double plaited knit fabric having spandex as the plaited yarn possesses elastic deformation in both the length and width directions thereof and the ability to be precisely severed without significant raveling. Further and other advantages will become apparent from a reading of the following description given with reference to the various figures of drawing.

-4-

Figure 1 of the drawings illustrates the fabric 1 in accordance with this invention. As illustrated in Figure 1 the fabric extends along its length in the Y direction and across its width in the X direction. As generally utilized in knitting terminology the Y direction is generally referred to as the warp direction while the X direction is referred to as the weft direction. The fabric which is intended for medical and orthopedic support situations is elastically deformable in both the length and width directions and preferably may be extended from about 50 to 120% in both directions. The fabric may be produced to have a modulus of elasticity within desired ranges by selection of appropriate spandex and tensioning. The fabric is double plaited with spandex such that the spandex only exists within the central area of the fabric with the plaiting yarns coming in contact with the skin of a patient on which it is utilized.

The fabric in accordance with this invention has utilization wherein limbs may be wrapped so as to provide support in the two directions of elongation and may be severed to fit a particular area of the body. Additionally, the fabric may be knitted in tubular-form so as to form a surgical weight hose.

-5-

The fabric may be utilized for wrapping of limbs after surgery to prevent pooling of blood. Additionally, stockings or wrappings of the fabric in accordance with this invention may be utilized under tubular orthopedic plaster of paris casts. Previously, two sizes of stockings were required under plaster of paris casts in order to conform to the shape of a limb. However, with the dual stretch characteristics, the fabric of this invention may be utilized to conform to a tapering limb.

The medical utilization of the fabric of this invention includes the coverage of burned skin to both support and isolate the burned area from the surrounding environment.

Due to the characteristics of this fabric whereby it does not ravel upon severance it may be utilized about portions of the body where surgery is to be performed with incision made through the fabric and into the patient. Under such circumstances the elasticity of the fabric maintains the configuration of the body portion, while also preventing excessive swelling. The use of such fabric during orthoscopic surgery of the knee is an example.

Additionally, the fabric of this invention may be

-6-

utilized to isolate portions of the body during surgery due to its ability to conform to limbs. An example is the isolation of the foot area during surgery to the leg. Also, the fabric of this invention may be combined with a water impermeable lining material to aid in the isolation of such body portions.

The fabric of this invention is particularly adaptable for utilization where significant movement is required, such as bandages about the knee, ankle and elbow. The two direction stretch properties permit such utilization for orthopedic support while also allowing movement.

Figure 2 of the drawings illustrates the knit of the fabric of this invention, wherein the knitted pattern 3 is double plaited with the central yarn 5 being spandex and with the outer yarns being preferably of cotton 7 and/or polyester 9. It is seen in Figure 2 that the cotton 7 due to the plaiting and knitting with a tight front bed and loose back bed results in cotton 7 appearing on both surfaces of the fabric. A knit yarn feeder 50 is illustrated in Figure 3 for producing this result.

The term "spandex" as utilized within this specification is utilized in its common generic context, meaning an elastomeric polyurethane which may be any of the



-7-

fabrics sold under the trademark LYCRA. Generally, spandex may be of 120 to about 800 denier. The knit fabric is ribbed preferably of a 1x1 rib. It is preferred to utilize a single stitch rib due to enhanced elasticity of such a fabric.

5 The preferred fabric in accordance with this invention utilizes as one of the knitting yarns 100% combed cotton. The cotton may have a cotton count of about 26/1 to 40/1.

10 In the preferred form the other knitting yarn is continuous filament polyester. Preferably the polyester is a single ply comprising from about 20 to 40 filaments. The polyester may be from about 100 to 200 denier depending on the particular desired applications.

15 The elastic characteristics in the width direction imparted to this fabric are due in part to the single-stitch rib construction as well as to the spandex plaited yarn. The spandex, however, is entirely responsible for the stretch and elongation characteristics in the length direction.

20 To a large extent, the ability of the fabric to be severed without raveling is attributable to the presence of spandex. The fabric if knitted without spandex ravel to

-8-

some extent but surprisingly when spandex is utilized the fabric itself does not ravel. This is a surprising and unexpected advantage of this invention.

As many terms are utilized within this description which are particular to the knitting art, such terms have the common meanings thereof as are described in DUBIED KNITTING MANUAL, Edward Dubied and Cie Sa, Neuchatel, Switzerland, Copyright 1967, which is herewith incorporated by reference.

As many variations will become apparent from a reading of the above description, such variations are included within the spirit and scope of this invention as defined by the following appended claims.

-9-

That which is claimed:

5           1.    A fabric for orthopedic support and medical use comprising a double plaited ribbed knit fabric, said fabric plaited with spandex to provide a fabric with elastic properties in both the length and width directions thereof.

10           2.    The fabric according to claim 1 wherein said spandex is plaited with cotton and polyester on both the face and back of said fabric in order to maintain the spandex covered and thus not exposed to contact with skin.

          3.    The fabric according to claim 1 wherein said rib fabric is a 1/1 rib single stitch knit.

15           4.    The fabric according to claim 1 wherein said polyester is a continuous filament polyester having a denier from about 100 to 200 and of single ply comprising 20 to 40 filaments.

          5.    The fabric according to claim 1 wherein said fabric may be severed without significant raveling.

20           6.    The fabric according to claim 1 in tubular form.

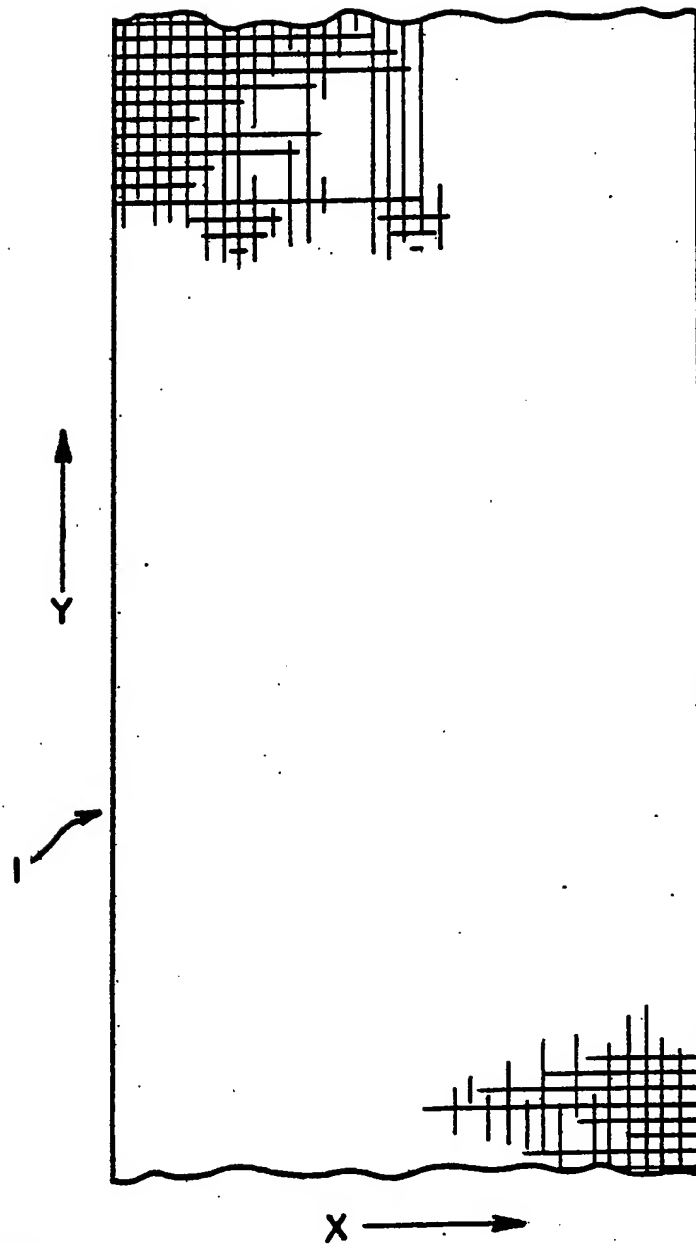


FIG. I

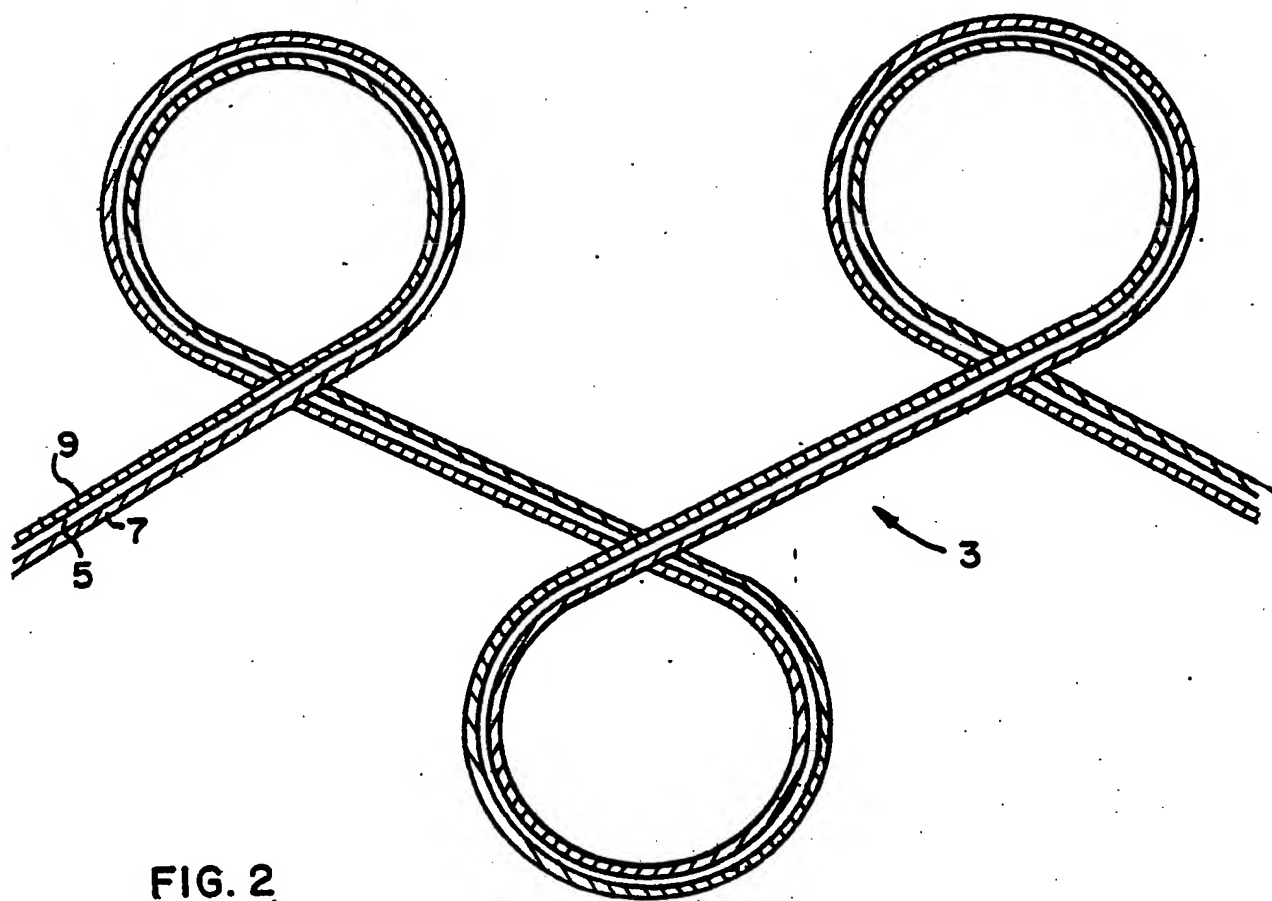


FIG. 2

3 / 3

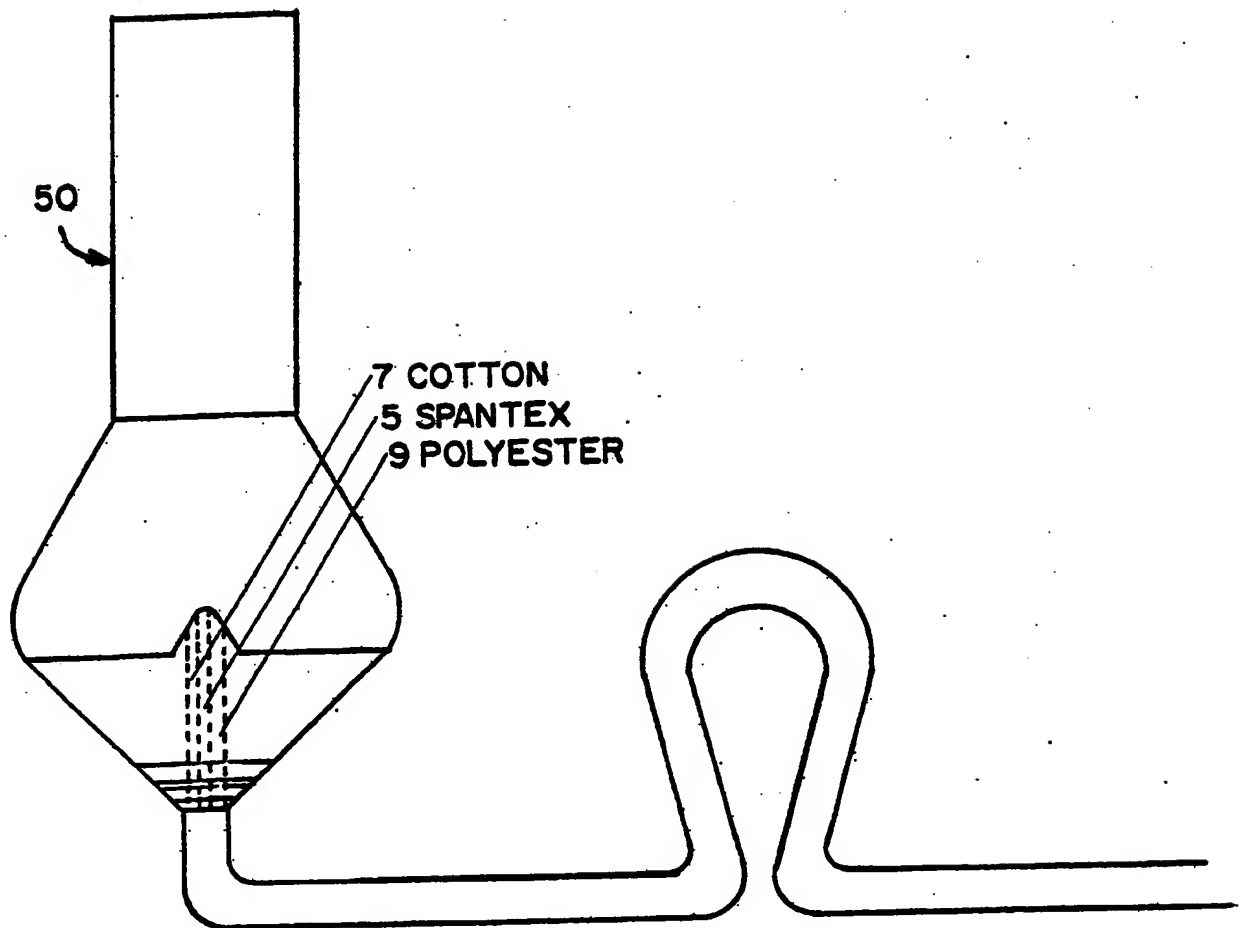


FIG. 3

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 85/00033

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>1</sup> According to International Patent Classification (IPC) or to both National Classification and IPC INT: CL. <u>34</u> D04B 7/16, 11/12, 21/12, 21/14, 21/16, 21/18, 23/06 U.S. CL. 66/137, 169R, 172E																				
<b>II. FIELDS SEARCHED</b> <div style="text-align: right; font-size: small;">Minimum Documentation Searched<sup>4</sup></div> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%; border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Classification System</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Classification Symbols</div> </td> </tr> <tr> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">U.S.</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">66/136, 137, 169R, 170, 172E, 192, 193, 196 200, 202 - 128/155, 156</div> </td> </tr> </table> <div style="text-align: center; font-size: x-small; margin-top: 5px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched<sup>5</sup></div>			<div style="border: 1px solid black; padding: 2px;">Classification System</div>	<div style="border: 1px solid black; padding: 2px;">Classification Symbols</div>	<div style="border: 1px solid black; padding: 2px;">U.S.</div>	<div style="border: 1px solid black; padding: 2px;">66/136, 137, 169R, 170, 172E, 192, 193, 196 200, 202 - 128/155, 156</div>														
<div style="border: 1px solid black; padding: 2px;">Classification System</div>	<div style="border: 1px solid black; padding: 2px;">Classification Symbols</div>																			
<div style="border: 1px solid black; padding: 2px;">U.S.</div>	<div style="border: 1px solid black; padding: 2px;">66/136, 137, 169R, 170, 172E, 192, 193, 196 200, 202 - 128/155, 156</div>																			
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; font-size: x-small;">Category<sup>6</sup></th> <th style="width: 60%; font-size: x-small;">Citation of Document, <sup>15</sup> with indication, where appropriate, of the relevant passages <sup>17</sup></th> <th style="width: 30%; font-size: x-small;">Relevant to Claim No. <sup>18</sup></th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">US, A, 2,009,361 Published 07 July 1935, Lawson. The invention consists of a plated 1x1 rib single knit utilizing two yarns of rubber and cotton.</td> <td style="text-align: center; vertical-align: top;">1-6</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">Y</td> <td style="vertical-align: top;">US, A, 3,069,885 Published 25 December 1962 Cooper. The construction involves a plated knit elastic fabric which may be utilized as surgical dressings.</td> <td style="text-align: center; vertical-align: top;">2,4</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td style="vertical-align: top;">US, A, 2,536,163 Published 02 January 1951, Field. An example of a elastic run resistant fabric.</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td style="vertical-align: top;">US, A, 3,828,585 Published 13 August 1974, Thorneburg. Structure trips plating.</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top;">A</td> <td style="vertical-align: top;">US, A, 2,811,154 Published 29 October 1957, Scholl. Patent relates to a stretchable bandage.</td> <td></td> </tr> </tbody> </table>			Category <sup>6</sup>	Citation of Document, <sup>15</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>	Y	US, A, 2,009,361 Published 07 July 1935, Lawson. The invention consists of a plated 1x1 rib single knit utilizing two yarns of rubber and cotton.	1-6	Y	US, A, 3,069,885 Published 25 December 1962 Cooper. The construction involves a plated knit elastic fabric which may be utilized as surgical dressings.	2,4	A	US, A, 2,536,163 Published 02 January 1951, Field. An example of a elastic run resistant fabric.		A	US, A, 3,828,585 Published 13 August 1974, Thorneburg. Structure trips plating.		A	US, A, 2,811,154 Published 29 October 1957, Scholl. Patent relates to a stretchable bandage.	
Category <sup>6</sup>	Citation of Document, <sup>15</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>																		
Y	US, A, 2,009,361 Published 07 July 1935, Lawson. The invention consists of a plated 1x1 rib single knit utilizing two yarns of rubber and cotton.	1-6																		
Y	US, A, 3,069,885 Published 25 December 1962 Cooper. The construction involves a plated knit elastic fabric which may be utilized as surgical dressings.	2,4																		
A	US, A, 2,536,163 Published 02 January 1951, Field. An example of a elastic run resistant fabric.																			
A	US, A, 3,828,585 Published 13 August 1974, Thorneburg. Structure trips plating.																			
A	US, A, 2,811,154 Published 29 October 1957, Scholl. Patent relates to a stretchable bandage.																			
<div style="display: flex; justify-content: space-between; font-size: x-small;"> <div style="width: 45%;"> <p>• Special categories of cited documents: <sup>16</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 50%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principles or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"G" document member of the same patent family</p> </div> </div>																				
<b>IV. CERTIFICATION</b> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Date of the Actual Completion of the International Search <sup>3</sup></div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Date of Mailing of this International Search Report <sup>1</sup></div> </td> </tr> <tr> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">08 February 1985</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">01 MAR 1985</div> </td> </tr> <tr> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">International Searching Authority <sup>1</sup></div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Signature of Authorized Officer <sup>20</sup></div> </td> </tr> <tr> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">ISA/US</div> </td> <td style="border: none; vertical-align: top;"> <div style="border: 1px solid black; padding: 2px;">Mary A. Ellis <i>Mary A. Ellis</i></div> </td> </tr> </table>			<div style="border: 1px solid black; padding: 2px;">Date of the Actual Completion of the International Search <sup>3</sup></div>	<div style="border: 1px solid black; padding: 2px;">Date of Mailing of this International Search Report <sup>1</sup></div>	<div style="border: 1px solid black; padding: 2px;">08 February 1985</div>	<div style="border: 1px solid black; padding: 2px;">01 MAR 1985</div>	<div style="border: 1px solid black; padding: 2px;">International Searching Authority <sup>1</sup></div>	<div style="border: 1px solid black; padding: 2px;">Signature of Authorized Officer <sup>20</sup></div>	<div style="border: 1px solid black; padding: 2px;">ISA/US</div>	<div style="border: 1px solid black; padding: 2px;">Mary A. Ellis <i>Mary A. Ellis</i></div>										
<div style="border: 1px solid black; padding: 2px;">Date of the Actual Completion of the International Search <sup>3</sup></div>	<div style="border: 1px solid black; padding: 2px;">Date of Mailing of this International Search Report <sup>1</sup></div>																			
<div style="border: 1px solid black; padding: 2px;">08 February 1985</div>	<div style="border: 1px solid black; padding: 2px;">01 MAR 1985</div>																			
<div style="border: 1px solid black; padding: 2px;">International Searching Authority <sup>1</sup></div>	<div style="border: 1px solid black; padding: 2px;">Signature of Authorized Officer <sup>20</sup></div>																			
<div style="border: 1px solid black; padding: 2px;">ISA/US</div>	<div style="border: 1px solid black; padding: 2px;">Mary A. Ellis <i>Mary A. Ellis</i></div>																			

**FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET**

US, A, 3,570,482 Published 16 March 1971.  
Emoto. Invention pertains to an elastic  
surgical wrap knit bandage.

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE 10

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers \_\_\_\_\_ because they relate to subject matter<sup>13</sup> not required to be searched by this Authority, namely:

- 2 ☐ Claim numbers \_\_\_\_\_; because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out <sup>12</sup>, specifically:

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING 11

**This International Searching Authority found multiple inventions in this international application as follows:**

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

### Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.  
☐ No protest accompanied the payment of additional search fees.



1/3

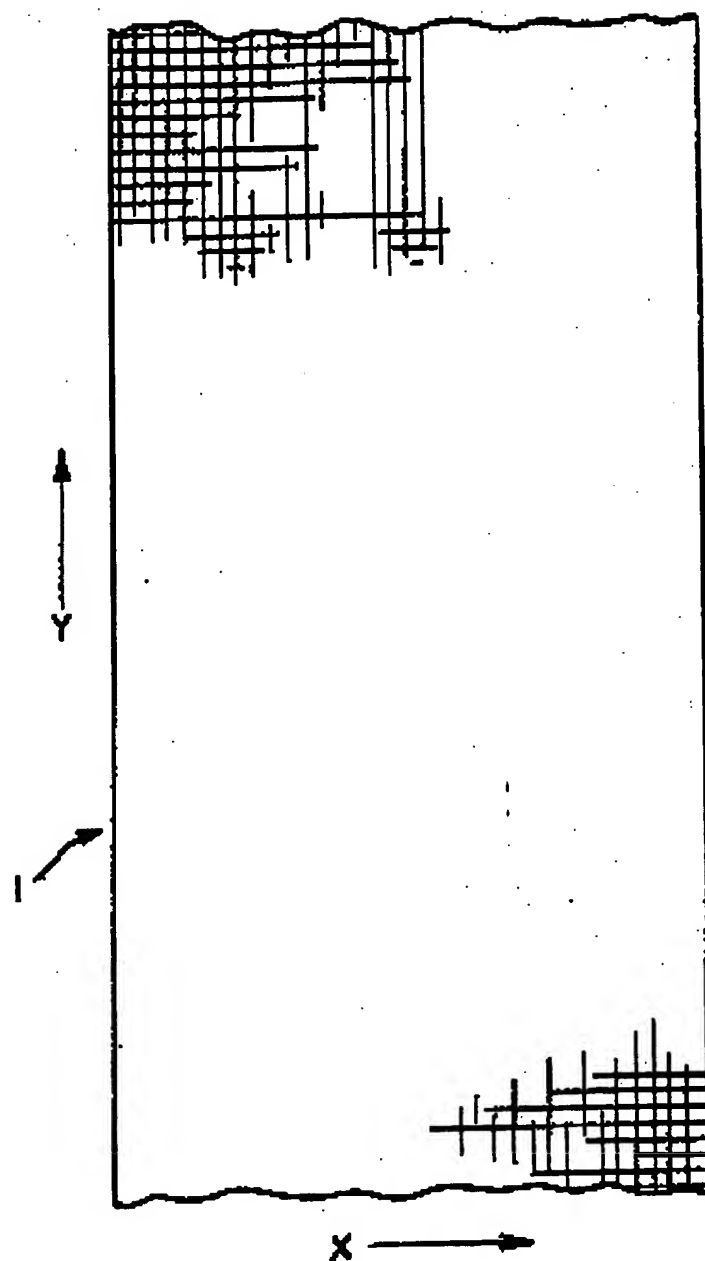
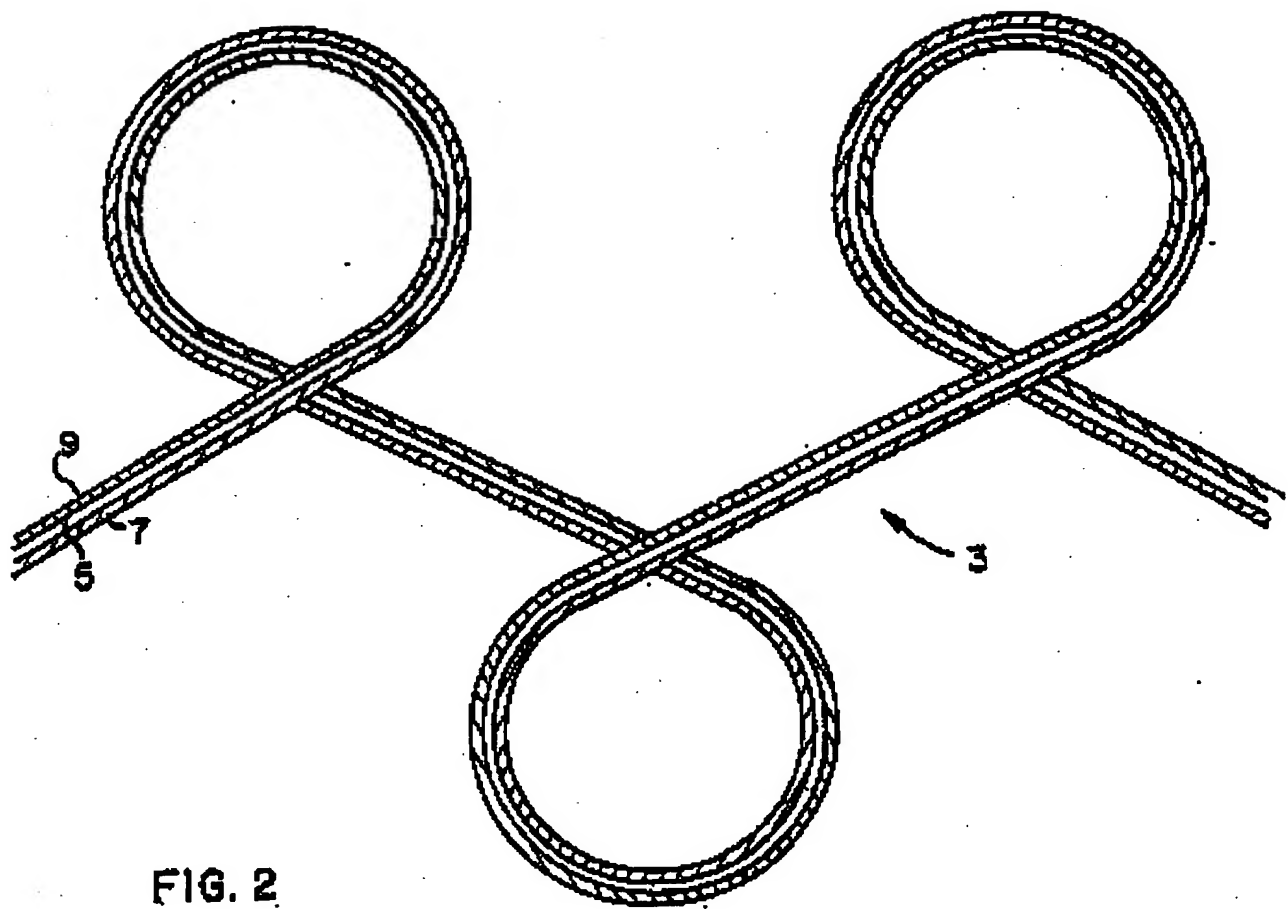


FIG. 1



3/3

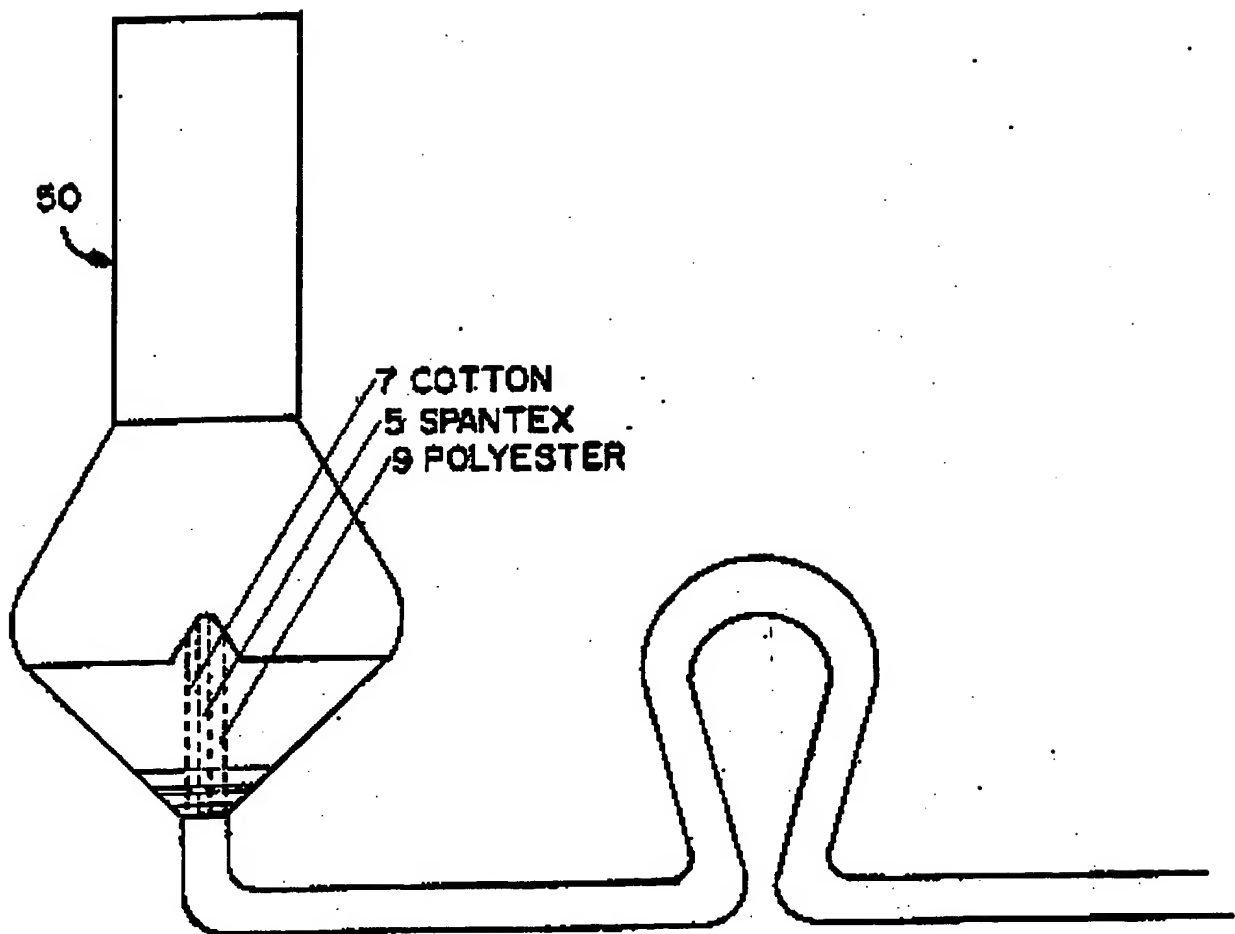


FIG. 3

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

☒ **BLACK BORDERS**

☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**

☐ **FADED TEXT OR DRAWING**

☒ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**

☐ **SKEWED/SLANTED IMAGES**

☒ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**

☐ **GRAY SCALE DOCUMENTS**

☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**

☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**

☐ **OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**